Northern Colusa Saddle Dam Sites

The northern Colusa saddle dam alignment is along the far northern end of the proposed Colusa Reservoir (Figure 9). It is along a 3 -mile long ridge that is in portions of Section 18, T19N, R4W, and Sections 13, and 14, T19N, R5W on the Fruto and Stone Valley 7.5-minute USGS topographic quadrangles. The ridge varies in elevation from 399 to 699 feet and will require five saddle dams to close gaps that are below the proposed dam crest elevation of 540 feet. These dams would range in length from 200 to 3,180 feet and in height from 20 to 142 feet.

The USBR or DWR has performed no prior geologic work. No exploration other than a cursory overview was performed as part of this investigation.

Alignment Geology

The geology of the area consists of a series of interbedded mudstone, sandstone, and conglomerate units of the Great Valley sequence. These trend roughly north-south with a dip that varies from west to east. The Fruto syncline is west of the alignments, with moderate westerly dips on the eastern limb. These dips change from westerly to easterly southeast along the alignment since the Sites anticline intersects the eastern portion of the alignment. The alignment lies mostly within mudstone and siltstone of the Boxer Formation with some scattered sandstone interlayers.

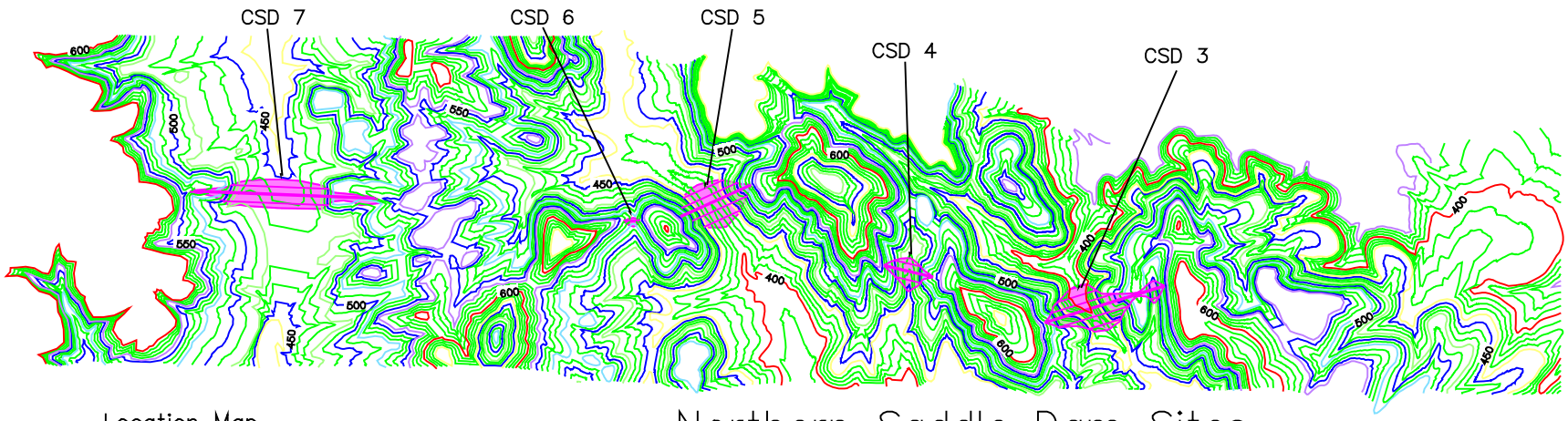
Bedrock Units

The proposed alignment strikes across sedimentary rocks that strike slightly northeast and dip easterly 50 to 55 degrees. This means that the foundation conditions vary as the relative percentages of the sandstone and mudstone change across the geologic structure.

The foundations of the five proposed saddle dams are composed of interlayered beds of Upper Cretaceous sandstone, siltstone, mudstone, and conglomerate of the Boxer Formation.

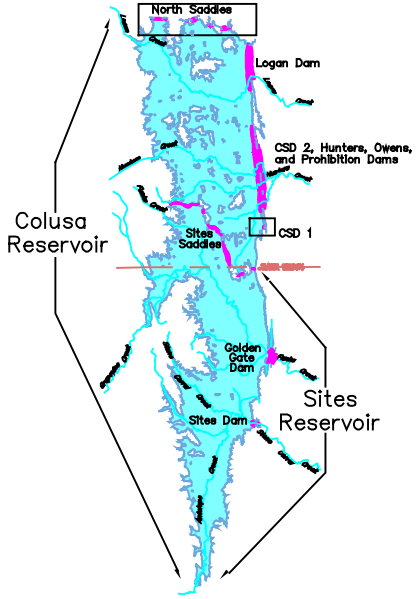
The mudstone unit in bedrock is dark gray to black in color and tan where weathered. Bedding is thinly laminar with thin sandstone and siltstone interbeds. It is brittle and slakes and weathers rapidly when exposed to air and moisture. It is moderately indurated to friable, moderately hard to weak and closely fractured.

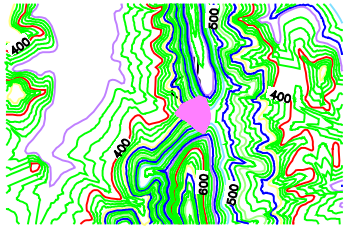
The Pleistocene age Tehama Formation outcrops on the ridge tops in the vicinity of the Colusa saddle dam alignment. Where it has been observed in this area it consists of a buff-colored tuffaceous sandstone resting with a sharp angular unconformity on the upturned beds of the Boxer Formation.



Northern Saddle Dam Sites

Location Map





Saddle Dam Site 1 (CSD 1)

N

0 1500 3000 4500

Feet

Dam footprints shown have a 20 foot crest width
Side slopes of 3:1 U/S and 2.5:1 D/S

40 foot contours digitized from USGS 7.5 minute quadrangle maps.
10 foot contours generated by Eagle Point software.

Proposed Dam Crest = 540 ft
Spillway Crest = 520 ft
Minimum Pool = 320 ft
Contour Interval = 10 ft

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHERN DISTRICT

LOCATION MAP OF THE COLUSA SADDLE DAM SITES

FIGURE 9

Filename:N:\NDSharedInfo\typing\geo\Final 1999 Sites Report\Figures\original\Figure 9--North Saddle Dams Loc--01-19-01--JHM.dwg
Layout Name:Layout1 Plot Time: Jan 19, 2001 - 4:10pm

Unconsolidated Deposits

Unconsolidated deposits at the saddle dam alignment consist of alluvium and colluvium.

Alluvium occurs along the valley floor and stream channels that are crossed by the saddle dams.

Colluvium occurs at the base of the steeper slopes and consists of clayey silt and sand with angular rock fragments. This deposit ranges from 2 to 5 feet in thickness.

Structure

The primary structural feature along the northern Colusa saddle dam alignment is the Sites anticline and the associated Salt Lake fault. Northerly striking, east-dipping homoclinal bedding of the Great Valley sequence has been folded by the Salt Lake fault to vary the dip of the bedding from west to east. This is complicated by associated northeast-trending tear faults that also cut across structure.

Faults and Folds

U.S. Geological Survey mapped (Calif., Glenn and Colusa Counties 1961) the Salt Lake fault as intercepting the proposed alignment. It is a major north-south trending thrust fault that is associated with the adjacent Sites anticline. It extends from near Cache Creek to the south up the Antelope Valley, then attenuates about 10 to 15 miles to the north of the alignment. The Salt Lake fault parallels the Sites anticline, a major doubly plunging, isoclinal anticline on the west side of Logan Ridge. This anticline and the Fruto syncline to the west extend a distance of at least 40 miles or more. This anticline and fault are being mapped in more detail by the consulting firm of William Lettis and Associates as part of the ongoing Sites and Colusa Reservoir project fault and seismic investigation.

Foundation Conditions and Exploration

The work performed has led to three basic conclusions. The first is that very few rock outcrops exist within the areas proposed for the saddle dams. This makes it difficult to analyze the current geotechnical data for design purposes and has led to the recommendations for additional work. The second conclusion is that several of the dam axes trend normal to the strike of the geologic units. Additional work will be needed to evaluate these conditions. The third conclusion is that the presence of fault or fracture zones crossing dam alignments may create foundation

and/or permeability problems and need further evaluation. The rock at the northern Colusa saddle dam alignment will probably provide good foundations for the proposed saddle dams with moderate stripping; however, several other concerns exist. There is a possibility that faults intersecting the alignment are active. Following is a site-by-site discussion of geologic conditions and additional work recommended. The discussion starts at DWR saddle dam site number 3 and proceeds westward through DWR saddle dam site number 7.

DWR Saddle Dam Site Number 3

This dam will have a maximum height of approximately 142 feet and a total length of 1,900 feet. Surface conditions are clayey topsoils underlain by mostly siltstones of the Boxer Formation. The Tehama Formation occupies the east abutment of this saddle dam.

A significant geologic concern at this site is that the dike structure will be constructed across the strike of the beds and across the contact between the Tehama and Boxer Formations. Because the area has a thick soil cover, additional drilling and trenching may be required to better define the geologic conditions.

DWR Saddle Dam Site Number 4

This dam will have a maximum height of approximately 80 feet and a total length of about 915 feet. Surface conditions consist of clayey soils with no rock outcrops mapped within the footprint of the dam. Like that of saddle dam site number 3, the axis of number 4 trends normal to the strike of the beds. It is recommended that trenching be performed along the axis to define the depth to bedrock. An additional drill hole may be required to determine in-situ geologic conditions beneath the dam.

DWR Saddle Dam Site Number 5

This dam will have a height of about 130 feet and a length of 1,300 feet. Surface conditions vary from sandy to clayey rich soils, underlaid by sandstones, siltstones, and claystones of the Boxer Formation.

DWR Saddle Dam Site Number 6

This dam occupies a small saddle, has a maximum height of 20 feet, and a length of approximately 200 feet. Surface conditions are clayey soils, with occasional sandstone and calcareous material appearing as float.

DWR Saddle Dam Number 7

This dam will have a maximum height of 100 feet and a total length of more than 3,180 feet. Surface conditions are sandy to clayey soils with a few scattered sandstone outcrops.

Conclusions and Recommendations

This is only a brief office assessment of the alignment since DWR does not have access onto this private property. As such, it is very preliminary and will require the following work for an acceptable evaluation.

- Perform geologic mapping of the dam sites and some limited subsurface exploration to assess the subsurface conditions.

- Perform seismic refraction surveys and auger holes to estimate depths of overburden in the saddles for stripping estimates.

- Map all landslides that either exist on the footprints for the outlet works or that could impact the proposed facilities in any way.

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The following draft documents are available for viewing at Northern District offices, California Department of Water Resources:

Technical Memorandum A. Drill core logs, soil logs, drilling chronologies and photographs.

Technical Memorandum B. Water pressure testing analysis.

Technical Memorandum C. Well completion and water level monitoring.